

<p>Kingdom of Saudi Arabia Ministry of Higher Education Qassim University College of Engineering</p>		المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة
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CE 676 Solid Waste Management

College: Engineering

Department: Civil

First: Course Definition

1- Course Code: CE 676

2- Units: 3

3- Semester:

4- Prerequisite:

5- Co-requisite:

6- Location (if not on main Campus):

Second: Course Objectives

- 1- To quantify and characterize municipal solid waste (MSW) in a country and to recognize properties commonly associated with MSW.
- 2- To describe the tasks and logistics of MSW collection, to analyze collection systems, and to become familiar with the principals and theory behind the use of transfer stations.
- 3- To describe the components of a landfill and processes, which take place in a landfill.
- 4- To perform the basic design calculations associated with landfills.
- 5- To describe the most common waste processing techniques and their application areas.
- 6- Identify concepts of reduction, reuse and recycle.
- 7- To develop a strategy to deal with special wastes, hazardous and health care waste.

1- Topics to be covered

Subject	No of Weeks	Units
Introduction to solid waste management	1	3

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Solid waste characterization: quantity and quality	1	3
Generation of waste per capita and region, composition of waste	1	3
Small scale industry waste in domestic waste, organic agricultural waste, industrial waste	1	3
Mixed collection or separation at source, logistics, transfer stations, machine park planning	1	3
Treatment based on type of waste, anaerobic digestion	1	3
Composting, recycling of plastics, batteries, e-waste, Incineration	1	3
Land fill: planning, land fill design; biology	1	3
Leachate production, collection and treatment	1	3
Land fill: redesigning an existing dump site	1	3
Land fill: operational and maintenance aspects	1	3
Land fill: methane production	1	3
Land fill: safety issues & public health, post-closure phase	1	3
Hazardous, health care and other special waste	1	3

2- Course components (Total hrs in the Semester: 42)

Lecture	Exercise	Other
42	-	0

3- Intended Learning Outcomes of the Course (ILO's)

a. Knowledge

i) Description of the knowledge to be acquired:

- Solid waste characteristics
- Solid waste collection and minimization
- Treatment of organic solid waste
- Design of landfill
- Operation and maintenance of landfill
- Methane and energy production from land fill
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ii) Teaching strategies to be used to develop that knowledge

- Class lectures.

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- Term projects.
 - Students' presentations.
 - Group discussion.
- iii) Methods of assessment of knowledge acquired**
- Exams.
 - Quizzes.
 - Homework assignments.
 - Term projects.
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b- Cognitive (Intellectual) Skills

- i) Cognitive skills to be developed***
- Characterization of solid waste.
 - Selection of the optimum layout of the landfill.
 - Differentiation among a variety of factors that influence quantity and quality of solid waste.
 - Design land fill and leachate treatment units.

- ii) Teaching strategies to be used to develop these cognitive skills***
- Class lectures.
 - Case studies analysis.
 - Term projects.
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- iii) Methods of assessment of students' cognitive skills***
- Students' seminars and presentations.
 - Term projects.
 - Written reports.
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c. Interpersonal Skills and Responsibility

- i) Description of the interpersonal skills and capacity to carry responsibility to be developed***

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- Decision making based on engineering analysis.
- Communication skills.
- Team work.
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- ii) Teaching strategies to be used to develop these skills**
- Class lectures.
 - Term projects.
 - Case studies analysis.
- iii) Methods of assessment of students' interpersonal skills and capacity to carry responsibility**
- Term project.
 - Written reports.
 - Students' seminars and presentations.

d. Communication, Information Technology and Numerical Skills

- i) Description of the skills to be developed in this domain**
- Literature research.
 - Problems modeling.
 - Utilization of computer applications in analysis and design.

- ii) Teaching strategies to be used to develop these skills**
- Class lectures.
 - Case studies analysis.
 - Computer lab sessions.
 - Term projects.
- iii) Methods of assessment of students numerical and communication skills**
- Term projects.
 - Written reports.
 - Students' seminars and presentations.
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e. Psychomotor (if applicable) & Other Non-cognitive Skills

- i) Description of the psychomotor or other skills to be developed and the level of performance required**
- NA

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ii) Teaching strategies to be used to develop these skills-
- NA

iii) Methods of assessment of student's psychomotor skills
- NA

4- Student Assessment Schedule

Serial	Assessment tool (test, group project, examination etc.)	Week due	Weight
1	Term Project – 1	3 rd	15 %
2	Mid Term Exam -1	7 th	15 %
3	Term Project – 2	10 th	15 %
4	Term Project – 3	13 th	15 %
5	Final Exam	16 th	40 %

5- Student Support

- Providing electronic library of textbooks and scientific periodicals.
- Providing the necessary computer applications for the course.

6- Learning Resources

i) Essential Books (References)

- Thomas H. Christensen, T. H. "Solid Waste Technology and Management," 2nd Volume, Wiley, 2010, ISBN-13: 978-1405175173.
- Kreith, F. and Tchobanoglous, G. "Handbook of Solid Waste Management, McGraw-Hill Professional, 2002, ISBN-13: 978-0071356237.

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ii) Course Notes

- NA
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iii) Recommended Books

- Young, G. C. "Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons," Wiley, 2010, ISBN-13: 978-0470539675.
- Reddy, P. J. "Municipal Solid Waste Management: Processing - Energy Recovery - Global Examples," CRC Press, 2011, ISBN-13: 978-0415690362.

iv) Electronic Books & Web Sites:

- Scientific journals and forums.
- Instructor's instruction.
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v) Periodicals

- ASCE scientific journals.
- EPA and IWA publications
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7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Students' questioners.
- Students' evaluation of course and instructor.
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ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Public faculty seminars.
- Assessment by external evaluators of students achievements.
- **Instructor (Course) Report**
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iii) Processes for Improvement of Teaching

- Assessment of students' work by external examiners.
- Analysis of students' evaluation of course and instructor.
- Seminars by industry professionals.
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iv) Processes for verifying standards of student achievement

- Check marking by an independent faculty member of a sample of student work.
- Periodic exchange and remarking of a sample of assignments/exams with a external evaluator.
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v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Assessment and evaluation of the level of achieving the course outcomes through a continuous improvement process (part of a quality assurance system established by the university),
- Consequently, actions are to be taken to improve the course delivery when necessary.
- Review of the course objectives, outcomes and curriculum every 2 years.